

## **REMARKS**

### **I. Introduction**

Claims 1 to 5 and 9 to 10 are pending in the present application. Claims 6 to 8 were previously withdrawn from consideration and are canceled herein without prejudice. Claims 1 to 5 and 9 to 10 stand rejected under 35 U.S.C. § 112, second paragraph as indefinite for allegedly failing to particularly point out and distinctly claim the subject matter of the invention. Claim 1 stands rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of U.S. Patent No. 3,653,946 ("Fefferman"), U.S. Patent No. 2,984,575 ("Fitch") and U.S. Patent No. 5,795,841 ("Kuerschner et al."). Claims 2 to 5 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Fefferman, Fitch, Kuerschner et al. and U.S. Patent No. 5,759,230 ("Chow et al."). Claims 9 to 10 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Fefferman, Fitch, Kuerschner et al. and U.S. Patent No. 5,052,382 ("Wainright").

In view of the foregoing amendments and the following remarks, it is respectfully submitted that all of the presently pending claims are allowable, and reconsideration is respectfully requested.

### **II. Rejection of Claims 1 to 5 Under 35 U.S.C. § 112**

Claims 1 to 5 and 9 to 10 stand rejected under 35 U.S.C. § 112, second paragraph as indefinite for allegedly failing to particularly point out and distinctly claim the subject matter of the invention.

The Final Office Action states that the term "high" is indefinite and further states that "[f]or purposes of applying art, the term 'high' has been treated as inclusive of any amount of aluminum oxide." Final Office Action at p. 2. However, the term "high" in the context of "high aluminum-oxide-containing tube" refers to a tube made of a material having properties similar to the properties of a quartz tube that can resist operating temperatures above 1400°C. In this regard, the Examiner's attention is directed to, for example, page 3, lines 13 to 17 of the Specification, which state that "tubes made of quartz or high aluminum-oxide-containing materials are chosen to serve as ozone generating tubes, and gold is selected as the coating metal for the reasons that quartz or high aluminum-oxide-containing materials can endure a temperature above 1400°C and gold is a good conductor." The Examiner's attention is further directed to page 3, lines 25 to 26 of the Specification,

which state that “quartz tubes or high aluminum-oxide-containing tubes are used as dielectric, and are able to endure temperature above 1400°C,” and to page 4, lines 15 to 17 of the Specification, which state that “the tube body 12 is made of materials, such as quartz or high aluminum-oxide-containing materials, which has the property of enduring temperature above 1400°C.”

In view of the foregoing, it is respectfully submitted that the Specification plainly describes certain aspects of the high aluminum-oxide-containing tube that belie the unrestricted and unreasonable reading of the term “high” in the context of “high aluminum-oxide-containing tube” to be “inclusive of any amount of aluminum oxide” as asserted in the Final Office Action.

Case law clearly supports the foregoing and provides that the terms of a claim must be given “reasonable interpretations” based on the Specification -- and not simply any broad and unrestricted reading of those terms. See In re Weiss, 26 U.S.P.Q.2d 1885, 1887 (Fed. Cir. 1993) (when interpreting a claim term or phrase, one must “look to the specification for the meaning ascribed to that term”; Board reversed) (unpublished decision); In re Okuzawa, 190 U.S.P.Q. 464, 466 (C.C.P.A. 1976) (“claims are not to be read in a vacuum, and limitations therein are to be interpreted in light of the specification in giving them their broadest reasonable interpretation”; Board reversed; emphasis in original) (citing In re Royka, 180 U.S.P.Q. 580, 582 to 83 (C.C.P.A. 1974) (claims are “not to be read in a vacuum and while it is true that they are to be given the broadest reasonable interpretation during prosecution, their terms still have to be given the meaning called for by the specification of which they form a part”; Board reversed; emphasis in original); and In re Rohrbacher, 128 U.S.P.Q. 117, 119 (C.C.P.A. 1960) (an “applicant is his own lexicographer and words used in his claims are to be interpreted in the sense in which they are used in the specification”; Board reversed)). It is respectfully submitted that this is exactly the case here since contrary to the foregoing law, the Final Office Action simply reflects its own unreasonable reading of “high” in the context of “high aluminum-oxide-containing tube” without regard to the sense in which that phrase is used in the present application.

Nonetheless, claims 1, 3, 5, 9 and 10 have been amended herein without prejudice to delete the term “high” before “aluminum-oxide-containing tube” and to more clearly set forth the characteristics of the aluminum-oxide-containing tube. In this regard, claim 1 has been amended herein without prejudice to recite that the

aluminum-oxide-containing tube includes a content of aluminum-oxide sufficient to endure a temperature of 1400°C. Support for this amendment to claim 1 may be found, for example, on page 4, lines 15 to 17 of the Specification.

In view of the foregoing, it is respectfully submitted that claims 1 to 5 and 9 to 10 fully comply with the requirements of 35 U.S.C. § 112, and withdrawal of this rejection is therefore respectfully requested.

### **III. Rejection of Claim 1 Under 35 U.S.C. § 103(a)**

Claim 1 was rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Fefferman, Fitch, and Kuerschner et al. Applicants respectfully submit that the combination of Fefferman, Fitch and Kuerschner et al. does not render obvious claim 1 for the following reasons.

Claim 1 relates to a method of producing a gilded quartz or aluminum-oxide-containing tube for an ozone generating electrode. Claim 1 recites that the method includes preparing coating material which contains gold, cleansing a quartz or aluminum-oxide-containing tube, drying the quartz or aluminum-oxide-containing tube in a first drying step after the cleansing step, smearing the prepared coating material on the quartz or aluminum-oxide-containing tube to form a film thereon after the first drying step, drying the quartz or aluminum-oxide-containing tube in a second drying step after the smearing step, inspecting the dried quartz or aluminum-oxide-containing tube after the second drying step, putting the dried quartz or aluminum-oxide-containing tube into a stove after the second drying step, which is maintained at the temperature between 780 to 880°C, to bake for 10 to 14 hours, and retrieving the tube after the temperature in the stove is below 110°C, and putting the tube under room temperature. The method according to claim 1 provides that the gold coating has sufficient thickness and purity for suitable conductivity and that the gold coating is adhered on the surface of the tube sufficient to resist the impact of electrons at high voltages and high temperatures resulting from high electric current passing therethrough.

Fefferman purports to relate to a method of depositing an adherent gold film on the surfaces of a suitable substrate, Fitch purports to relate to gold tertiary mercaptides and method for the preparation thereof, and Kuerschner et al. purport to relate to a process for producing coated, nonporous support materials. The Final Office Action contends that Fefferman describes “preparing a coating material which

contains gold[,] cleansing the substrate . . . , which may be alumina[,] brushing . . . the prepared coating material on the substrate to form a film thereon[,] drying the substrate[,] baking the substrate at a temperature of 427-1054°C to form a gold film[,] and cooling the substrate to room temperature.” Final Office Action at p. 3. The Final Office Action admits, inter alia, that Fefferman does not disclose baking at 780 to 880°C for 10 to 14 hours. Final Office Action at pp. 3 to 4. The Final Office Action states that Fefferman discloses a temperature range that overlaps the claimed temperature range but admits that the baking time described by Fefferman is shorter than the claimed baking time. The Final Office Action contends that Kuerschner et al. describe that “adhesion of metals, such as gold . . . , to ceramic substrates, such as alumina or quartz . . . may be improved by heating at 200-1000°C for 0.5 to 24 hours.” Final Office Action at p. 4. The Final Office Action contends that “[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected a temperature and time form [sic] within the claimed ranges because [Kuerschner et al.] disclose[] that they are operative for increasing the adhesion of metals to ceramics.” Final Office Action at p. 4.

Applicants respectfully submit that the description by Kuerschner et al. of a broad range of 200 to 1000°C for the broad time range of 0.5 to 24 hours, when combined with Fefferman and Fitch as proposed in the Final Office Action, does not render obvious claim 1 for at least the reason that due to severe requirements of electrodes used in an ozone generator, e.g., high temperature, high electric current, high voltage, etc., the particular ranges of baking temperature and baking time are crucial to the usefulness of the tube as an electrode for an ozone generator. See MPEP § 716.01(a). In this regard, the Examiner’s attention is directed to, for example, page 3, lines 19 to 23 of the Specification, which state that “[t]he coating made by [the method of the present invention] adheres well on the surface such that it will not easily scale off under the impact of electrons at high frequency and high voltage” and that “high frequency is defined at the range of 15KHz to 40KHz; and the high voltage is defined at a peak-to-peak value from 10KV to 18KV.”

The temperature range of 427 to 1054°C, described by Fefferman, and the temperature range of 200 to 1000°C, described by Kuerschner et al., are too broad to satisfy the requirements of a gold film applied to a quartz tube or aluminum-oxide-containing tube according to the present invention. Neither Fefferman nor

Kuerschner et al. describes, or even suggests, any baking temperatures or times within their respective ranges and neither reference discloses, or even suggests, coating temperatures for a tube for an ozone generating electrode as claimed.

As further regards the “retrieving the tube after the temperature in the stove is below 110°C,” the Final Office Action again contends that Fefferman describes “that the cooling of the substrate should be controlled in order to reduce stress” and that “[t]he Examples indicate that this may be done by leaving the substrate in the furnace . . . until a certain temperature is reached.” Final Office Action at pp. 4 to 5. However, Fefferman state at col. 4, lines 46 to 48 that “[t]he substrate was allowed to cool slowly through normal radiation . . . to **400°F** [approximately **204°C**] whereupon it was removed from the furnace” (emphasis added). See also, col. 5, lines 4 to 6. Accordingly, Fefferman does not disclose, or even suggest, “retrieving the tube after the temperature in the stove is below 110°C” as recited in claim 1. As to the unsupported contention that the description of Fefferman “at col. 5, lines 10-12 makes it appear that the substrate may also be left in the oven until it reaches room temperature,” the Final Office Action continues to merely rely on nothing more than pure speculation and conjecture as to the statement of Fefferman located at col. 5, lines 10 to 12, to wit, “[a]fter reaching 1,200°F, the substrate is allowed to cool slowly through normal radiation to room temperature (3 hours).” It is respectfully submitted that the statement that “[a]fter reaching 1,200°F, the substrate is allowed to cool slowly through normal radiation to room temperature (3 hours)” does not provide a disclosure, or even a suggestion, of “retrieving the tube after the temperature in the stove is below 110°C, and putting the tube under room temperature” as recited in claim 1.

The Advisory Action states at page 3 that Fefferman at col. 5, lines 4 to 12 “suggests retrieving the tube from the furnace only after room temperature is reached” and that Fefferman “makes no indication that the exterior of the furnace is kept at a temperature other than room temperature, and therefore retrieving the substrate would also necessarily be putting it under room temperature.” Applicants respectfully disagree. Fefferman states at col. 5, lines 4 to 12:

The substrate was allowed to slowly cool through normal radiation (2 hours) to 400° F. whereupon it was removed from the furnace. Additional gold was electroplated on the gold coated substrate employing a conventional gold citrate plating bath whereafter the substrate was refired to 1,200° F. to improve adhesion of the resultant plated gold film to the

substrate. After reaching 1,200° F., the substrate is allowed to cool slowly through normal radiation to room temperature (3 hours).

Contrary to the assertions contained in the Advisory Action, nothing in the foregoing excerpt “indicates that the substrate is not disturbed during cooling,” and nothing in the foregoing excerpt “suggests retrieving the tube from the furnace only after room temperature is reached.” Thus, the conclusions and assertions contained in the Advisory Action are nothing more than pure conjecture or speculation, which cannot sustain an obviousness rejection.

The 780 to 880°C baking temperature range recited in claim 1, when used in the method as presently claimed, unexpectedly results in a coated tube with superior properties for an ozone generator electrode. The prior Affidavit of Kuang-Lang Huang sets forth, inter alia, that above 880°C, the gold coating may evaporate resulting in a thinner coating; that below 780°C, a gold coating may not adhere well to the surface of a tube made of quartz or Al<sub>2</sub>O<sub>3</sub>; and that for electrodes of an ozone generator, a baking temperature maintained in the range between 780°C and 880°C is crucial. In further support of these facts, attached to the Reply Under 37 C.F.R. § 1.116 filed on September 12, 2003 is a color photograph of: (i) samples of gold coated tubes used for ozone generator electrodes that were produced according to the claimed method; and (ii) samples of gold coated tubes in which the baking temperatures were outside of the claimed 780 to 880°C baking temperature range.

As seen in the photograph, at a baking temperature of 800°C, the tube has the “goldest” color and the least amount of the blackish-colored un-oxidized solvent as compared to tube baked at other higher and lower temperatures. The blackish-colored coating on the tubes baked at temperatures below 800°C is indicative of an inferior ozone generating electrode with a higher electrical resistance and thus, is more susceptible to damage from higher operating temperatures. For baking temperatures above 900°C, the gold coating evaporates during baking resulting in a thinner coating as indicated by the lighter colors of the tubes.

Applicants respectfully submit that this photographic evidence, taken in conjunction with Applicants’ prior and current arguments and the Affidavit of Kuang-Lang Huang, clearly establish that the specific baking temperature range of

claim 1 produces unexpected results for a coating of a tube for an ozone generating electrode.

Although the references cited in the Final Office Action may disclose broader ranges of baking temperature and time in forming the gold coating, the quality would not emulate that of the coating formed by the method as claimed.

The photograph shows the gold coatings formed under various baking temperatures. It can be noted that when the baking temperature is 800°C (i.e., between 780 and 880°C as recited in claim 1), the coating has the best gold color, whereas when the baking temperature is lower than or equal to 700°C, the coating appears blackish due to the un-oxidized solvent (initially existing in gold chloride solution) remaining in the coating. The blackish coating represents a higher electrical resistance and will produce a temperature high enough to damage the coating of a tube in case the tube has high electric current passing through. Also, coating formed under lower baking temperature would easily scale off from the surface of the tube.

When the baking temperature is higher than or equal to 900°C, the coating would evaporate and become thin, and thus appears less lustrous, and even disappears eventually when the baking temperature exceeds 1000°C.

The Advisory Action states at page 3 that “[t]here is no showing of the conditions which lead to the inferior results.” However, the photograph plainly shows that baking at or below 700°C or at or above 800°C results in inferior coating.

As to the feature of “retrieving the tube after the temperature in the stove is below 110°C,” because the thermal expansion coefficient of gold is greater than that of quartz, the coating of the tube that is retrieved at a higher temperature would easily scale off from the surface of the tube due to instantaneous thermal contraction to thereby reduce the lifespan of the tube.

In general, tubes that are retrieved at a high temperature would possess inferior coating adherence. Other than the inferior coating adherence, other features (e.g., conductivity, thickness and color of gold coating) of the tubes may not vary much from those tubes that are retrieved after natural cooling to lower than 110°C. Hence, the effects of retrieving the tubes at a high temperature might not be apparent at the initial operation of the ozone generator. However, after operating the ozone generator for a period of time, such as for six months, the reduction in the performance of the ozone generator applying tubes retrieved at a high temperature

would become apparent. The reduction in the performance of the ozone generator is particularly proportional to the temperature under which the tubes are retrieved from the stove.

On the other hand, there is no observation of significant reduction in the performance of the ozone generator applying tubes that are retrieved after natural cooling to lower than 110°C.

As set forth above, the method claimed includes the following limitations:

- (1) maintaining the baking temperature between 780 and 880°C;
- (2) baking the coating for 10 to 14 hours;
- (3) retrieving the tube after the temperature in the stove being below 110°C; ***and***
- (4) putting the tube under room temperature.

Only with all the four characteristics being possessed will the quality of the coating be obtained. However, none of the cited references, either singularly or in combination, fully discloses, or even suggests, all the characteristics recited in claim 1. Furthermore, none of the cited references, either singularly or in combination, discloses, or even suggests, operating conditions similar to those set forth in claim 1.

In rejecting a claim under 35 U.S.C. § 103(a), the Examiner bears the initial burden of presenting a prima facie case of obviousness. In re Rijckaert, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). To establish prima facie obviousness, three criteria must be satisfied. First, there must be some suggestion or motivation to modify or combine reference teachings. In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the claimed combination must be found in the prior art and not based on the application disclosure. In re Vaeck, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Second, there must be a reasonable expectation of success. In re Merck & Co., Inc., 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, the prior art reference(s) must teach or suggest all of the claim limitations. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). As indicated above, none of the references relied upon disclose, or even suggest, the critical parameters of putting the dried quartz or aluminum-oxide-containing tube in a stove, which is maintained at the temperature between 780 to 880°C, to bake for 10 to 14 hours or of retrieving the



tube after the temperature in the stove is below 110°C, and putting the tube under room temperature as recited in claim 1. It is therefore respectfully submitted that the combination of Fefferman, Fitch and Kuerschner et al. does not render obvious claim 1. The criticality of the temperature parameters and the unexpected results achieved by the critical temperature parameters recited in claim 1 are further evidence of the non-obviousness of claim 1.

Moreover, it is respectfully submitted that the cases of In re Fine, supra, and In re Jones, 21 U.S.P.Q.2d 1941 (Fed. Cir. 1992), make plain that the Final Office Action's generalized assertions that it would have been obvious to modify or combine the references do not properly support a § 103 rejection. It is respectfully submitted that those cases make plain that the Final Office Action reflects a subjective "obvious to try" standard, and therefore does not reflect the proper evidence to support an obviousness rejection based on the references relied upon. In particular, the Court in the case of In re Fine stated that:

The PTO has the burden under section 103 to establish a *prima facie* case of obviousness. It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. This it has not done. . . .

**Instead, the Examiner relies on hindsight in reaching his obviousness determination. . . . One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.**

In re Fine, 5 U.S.P.Q.2d at 1598 to 1600 (citations omitted; italics in original; emphasis added). Likewise, the Court in the case of In re Jones stated that:

Before the PTO may combine the disclosures of two or more prior art references in order to establish *prima facie* obviousness, there must be some suggestion for doing so, found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. . . .

**Conspicuously missing from this record is any evidence, other than the PTO's speculation (if it be called evidence) that one of ordinary skill . . . would have been motivated to make the modifications . . . necessary to arrive at the claimed [invention].**

In re Jones, 21 U.S.P.Q.2d at 1943, 1944 (citations omitted; italics in original).

That is exactly the case here since it is believed and respectfully submitted that the present Final Office Action offers no evidence whatsoever, but only conclusory hindsight, reconstruction and speculation, which these cases have indicated does not constitute evidence that will support a proper obviousness finding. Unsupported assertions are not evidence as to why a person having ordinary skill in the art would be motivated to modify or combine references to provide the claimed subject matter of the claims to address the problems met thereby. Accordingly, the Office must provide proper evidence of a motivation for modifying or combining the references to provide the claimed subject matter.

More recently, the Federal Circuit in the case of In re Kotzab has made plain that even if a claim concerns a “technologically simple concept” -- which is not the case here -- there still must be some finding as to the “specific understanding or principle within the knowledge of a skilled artisan” that would motivate a person having no knowledge of the claimed subject matter to “make the combination in the manner claimed,” stating that:

In this case, the Examiner and the Board fell into the hindsight trap. The idea of a single sensor controlling multiple valves, as opposed to multiple sensors controlling multiple valves, is a technologically simple concept. With this simple concept in mind, the Patent and Trademark Office found prior art statements that in the abstract appeared to suggest the claimed limitation. But, there was no finding as to the specific understanding or principle within the knowledge of a skilled artisan that would have motivated one with no knowledge of Kotzab's invention to make the combination in the manner claimed. In light of our holding of the absence of a motivation to combine the teachings in Evans, we conclude that the Board did not make out a proper prima facie case of obviousness in rejecting [the] claims . . . under 35 U.S.C. Section 103(a) over Evans.

In re Kotzab, 55 U.S.P.Q.2d 1313, 1318 (Fed. Cir. 2000) (emphasis added). Again, it is believed that there have been no such findings.

Of course, objective evidence, including evidence of unexpected results, are relevant and must be considered in every case in which they are present. See, Graham v. John Deere, 383 U.S. 1 (1966).

In view of all of the foregoing, it is respectfully submitted that claim 1 is patentable over the combination of Fefferman, Fitch and Kuerschner et al., and Applicants respectfully request withdrawal of the obviousness rejection.

**IV. Rejection of Claims 2 to 5 and 9 to 10 Under 35 U.S.C. § 103(a)**

Claims 2 to 5 were rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Fefferman, Fitch, Kuerschner et al. and Chow et al. Claims 9 to 10 were rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Fefferman, Fitch, Kuerschner et al. and Wainright. Applicants respectfully submit that claims 2 to 5 and 9 to 10 are patentable for the following reasons.

Claims 2 to 5 and 9 to 10 ultimately depend from claim 1 and therefore include all of the limitations of claim 1. As more fully set forth above, the Affidavit of Kuang-Lang Huang and the photographic evidence submitted herewith establish the criticality of the baking temperature and the unexpected results achieved at temperatures in this range thereby providing evidence of non-obviousness of claim 1. Neither Chow et al. nor Wainright are relied upon to cure the critical deficiencies of Fefferman, Fitch and Kuerschner et al. Indeed, they do not render the claimed range obvious. Accordingly, it is respectfully submitted that the combination of Fefferman, Fitch, Kuerschner et al. and Chow et al. does not render obvious claims 2 to 5, which ultimately depend from claim 1, and it is respectfully submitted that the combination of Fefferman, Fitch, Kuerschner et al. and Wainright does not render obvious claims 9 to 10, which also depend from claim 1. In re Fine, 837 F.2d 1071 (Fed. Cir. 1988) (any dependent claim that depends from a non-obvious independent claim is non-obvious).

**V. Conclusion**

It is therefore respectfully submitted that all of the presently pending claims are allowable. A favorable action on the merits is earnestly solicited.

Respectfully submitted,

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